10th International Conference on Residual Stresses
3-7 July 2016 | Sydney, Australia

ICRS-10 Partner

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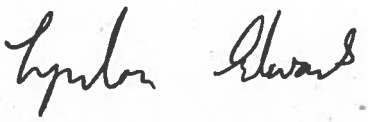
WELCOME

It is my pleasure to welcome you to ICRS-10, the 10th International Conference on Residual Stresses, which is being held at the Novotel Sydney Brighton Beach Hotel at Brighton Le Sands, Sydney.

ICRS-10 is the latest in a highly successful series which started in Garmisch-Partenkirchen (Germany) thirty years ago and continued in Nancy (France, 1988), Tokushima (Japan, 1991), Baltimore (USA, 1994), Linkoping (Sweden, 1997), Oxford (UK, 2000), Xi'an (China, 2004) and Denver (USA, 2008) and, again in Garmisch-Partenkirchen (Germany, 2012). The conference continues to be a key forum for scientists, students, and engineers interested in the prediction, evaluation, control, and application of residual stresses and ICRS -10 will feature over 150 presentations given by attendees from 30 countries.

I would like to take the opportunity to thank the organizing committee, the ICRS Scientific Board, our ICRS-10 Partner, our Sponsors, and our Exhibitors, for helping to make ICRS-10 a success.

Finally, I would like to give a special welcome and thanks to our international delegates who make up over 80% of the attendees at ICRS-10. I hope that you will have a truly stimulating time at ICRS-10 and that you also find time to enjoy the great city that is Sydney.



Prof Lyndon Edwards, Chair, ICRS-10

ICRS-10 Scientific Freedom Policy Statement

ICRS-10 shall observe the basic policy of non-discrimination and affirms the rights of scientists and engineers throughout the world to adhere or to associate with international scientific activity without restrictions based on nationality, race, colour, age, religion, political philosophy, ethnic origin, citizenship, language, or gender, in accordance with the Statues on the International Council for Science.

Effect of plasticity on residual stresses obtained by the incremental hole-drilling method with 3D FEM modelling

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Abstract

The incremental hole-drilling method is used to determine residual welding stresses near the weld connection of the deck plate with a longitudinal stiffener of an orthotropic steel deck. When comparing the measurement results with a theoretical residual stress distribution of an orthotropic steel deck, a large difference in sign and magnitude of the residual stress values is observed. The test method only applies when the material behavior remains linear-elastic. When the incremental hole-drilling method is used to evaluate high residual welding stresses, plastic relaxation strain can be induced in the region of the borehole. This plastic behavior can result in significant errors during the determination of the residual stresses.

The calculation software Siemens NX 9.0 is used to simulate the hole-drilling procedure with a 3D FEM model. First, a 3D model is set up for uniform in-depth residual stress fields with a linear-elastic material behavior to determine the calibration coefficients. The same model is used to determine similar calibration coefficients but this time with elastic-plastic material behavior. The effect of plasticity on the uniform in-depth residual stresses is determined. The residual stresses obtained under the assumption that the material behavior is linear-elastic are an overestimation. Finally, residual strains for non-uniform in-depth residual stresses are also studied with linear-elastic and elastic-plastic material laws. This will result in a more accurate determination of the residual weld stresses present in the orthotropic steel deck.